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Evaluating the impact of curriculum and assessment reform in secondary education on progression to mathematics post-16

Conference Abstract

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Abstract

In most education systems around the world there is a strong case for increasing the mathematical skills of young people beyond the age of 16. This should not only help satisfy demands for mathematically skilled people in the labour market but, more generally, should help ensure that young people benefit from the analytical and problem-solving skills mathematics qualifications develop.

Recent international research looking at upper secondary mathematics participation (Hodgen & Pepper, 2019) showed that in England fewer than 20% of students persist with mathematics education beyond the age of 16. One reason for this could be a longstanding concern about how well the mathematics qualifications offered to students aged 14 to 16 (GCSE, General Certificate of Secondary Education) prepare them for advanced study (Rigby 2017).

In England, a programme of GCSE reform (in all subjects) started in 2015 with the intention of enriching the curriculum and better preparing students for future education or employment. For mathematics specifically, the new GCSE (first assessed in 2017) aimed to be more demanding, provide greater challenge for the most able students, and support progression to post-16 mathematics and subjects with mathematical content.

There were concerns, however, that the new mathematics GCSE could deter students from post-16 mathematics (*e.g.*, by reducing their confidence) and unintentionally reduce uptake. To date, little published research has addressed the impact of GCSE mathematics reform on mathematics learning and progression to post-16 study. The studies published, mostly qualitative in nature (e.g., Howard & Khan, 2019), found that teachers were positive about the extent to which the reformed GCSE prepared students for post-16 mathematics, and reported that the reformed GCSE would support students in other subjects with mathematical content.

The current research aims to add to the qualitative research mentioned above by approaching the question of how the reform of GCSE mathematics has affected progression to and performance in post-16 mathematics and maths-related subjects via quantitative analysis of entries and performance data available in the National Pupil Database, a longitudinal database for children in schools in England that links pupil characteristics to qualifications and attainment.

Candidates who completed a GCSE mathematics between 2014 and 2017 (2014-2016 pre-reform; 2017 post-reform) were followed up for two years and the post-16 qualifications they achieved included in the research. We investigated progression from GCSE mathematics pre- and post-reform to a range of different post-16 mathematics qualifications (core maths, maths, further maths), and to a range of post-16 maths-related subjects (Biology, Chemistry, Physics, Economics, Psychology).

We produced and compared descriptive statistics on the number and proportion of GCSE mathematics students progressing to the qualifications above, as well as marginal grade distributions in such qualifications, pre- and post-reform.

To further explore the effect of GCSE reform on progression to and performance in post-16 maths and maths-related subjects, and to take into account students' background characteristics (gender, overall prior attainment at school, level of socio-economic deprivation and type of school attended), multilevel logistic regression analyses were also carried out.

Contrary to fears about reduced uptake, this research showed that progression to mathematics post-16 generally increased following the recent reforms. The uptake of core maths and further maths increased independently of the grade achieved by students in their mathematics GCSE. However, for the mainstream mathematics qualification (not core or further maths), the increase in uptake was higher amongst those who achieved top grades in their mathematics GCSE than for students with just a pass. Performance in all three post-16 maths qualifications was, in contrast to teacher expectations, lower post-reform.

The research also found that progression to five maths-related subjects (Biology, Chemistry, Physics, Economics, and Psychology) was higher post-reform than pre-reform. However, compared to pre-reform years, performance was generally worse post-reform.

As with any reforms, changes take time to bed in but, in the interim, this research has raised important issues for the mathematics education community and for policy makers by increasing the understanding of how recent reforms to the GCSE mathematics have affected students and contributing evidence on its impact on progression to post-16 study.

Overall, the findings indicate that some aims of the curriculum and assessment reform in upper secondary mathematics (in particular, increasing uptake of post-16 mathematics) have been fulfilled. Going forward, it will be important to monitor the uptake of and performance in different post-16 mathematics qualifications (particularly by mid-attaining students), and continue to triangulate teacher perceptions with trends in attainment.

References

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Full papers

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